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KEY TO FLORIDA *Triatoma* WITH ADDITIONAL DISTRIBUTION RECORDS FOR THE SPECIES (Hemiptera, Reduviidae)[1]

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Chagas in 1909 (*1*)[6] first demonstrated that *Triatoma megista* Burmeister was an intermediate host of *Trypanosoma cruzi* (Chagas), a parasitic protozoan, causing a disease of children in South America. Since that time several papers by medical entomologists and parasitologists on the triatomines of North America have appeared. The most comprehensive of these is the bulletin by Usinger (*2*) on the subfamily Triatominae which gives descriptions and distribution data for species known from North and Central America and the West Indies. Usinger's work includes two species and two sub-species of the genus *Triatoma* which are known from Florida, namely: *Triatoma sanguisuga* (LeConte), *Triatoma sanguisuga ambigua* (Neiva), *Triatoma lecticularius* (Stal), and *Triatoma lecticularius floridana* Usinger.

In connection with premises inspections in evaluating the control of malaria vector *Anopheles quadrimaculatus* Say by residual house spraying with DDT, additional distribution records for the Florida species of *Triatoma* were obtained. These records

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[6] Italic figures in parentheses refer to Literature Cited.

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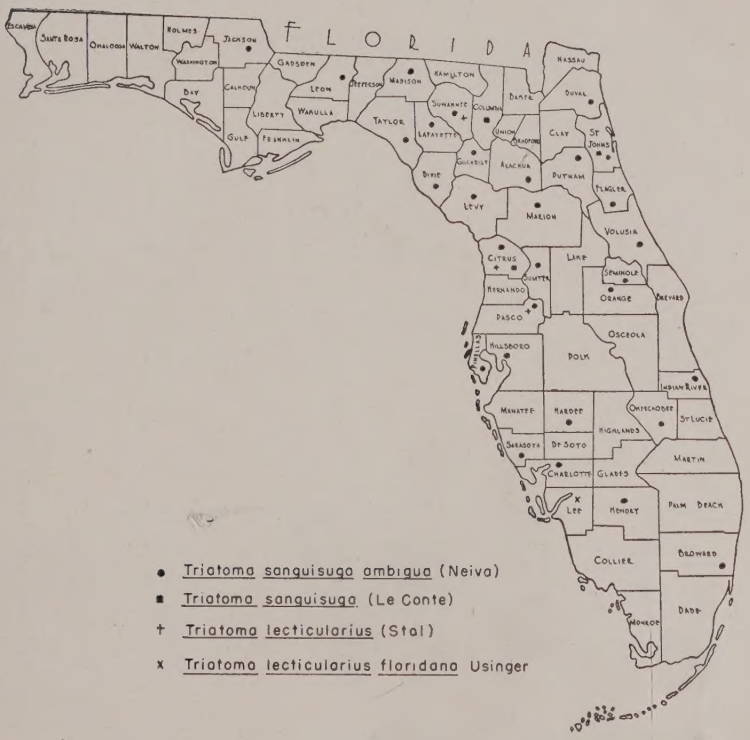

Figure No. 1—Counties From Which *Triatoma* spp. Have Been Reported.

which represent observations over a period of four years by Florida State Board of Health employees appear in Tables I and II. A map of Florida, Figure I, presents the known distribution of the species of Triatoma, (including Usinger's records).

For those persons who work with insects of medical importance in Florida a key is included which will be of assistance in determining species of *Triatoma* collected in the state. Anyone interested in studying the genus, or in the collections of Triatomines from other areas, should refer to Usinger's more extensive keys.

TABLE I.—COLLECTION RECORDS OF *Triatoma* spp. IN FLORIDA FROM 1944 THROUGH 1946.

County	Locality	Date	Species — Number and Stage	Collector
		1944		
St. Johns	Hastings	— Oct.	*T.s. ambigua*, 1N (skin)	D. C. Thurman
		1945		
Citrus	Inverness	24 April	*T. sanguisuga*, 1F	D. C. Thurman, J. Lovett
Citrus	Inverness	24 April	*T. lecticularius*, 1M	D. C. Thurman, J. Lovett
Citrus	Inverness	24 April	*T.s. ambigua*, 3M, 1F	D. C. Thurman, J. Lovett
Citrus	Inverness	6 June	*T.s. ambigua*, 1F	D. C. Thurman, J. Lovett
Citrus	Inverness	6 June	*T. lecticularius*, 1F	D. C. Thurman, J. Lovett
Citrus	Inverness	24 Aug.	*T.s. ambigua*, 1F	J. C. Burgess
Suwannee	Branford	7 Oct.	*T.s. ambigua*, 1F	M. Braswell
Suwannee	Branford	7 Oct.	*T. lecticularius*, 1	M. Braswell
		1946		
Citrus	Lecanto	16 Aug.	*T.s. ambigua*, 1M, 6F, 1N	D. C. Thurman, A. J. Obermuller
Citrus	Lecanto	16 Aug.	*T. lecticularius*, 1M	D. C. Thurman, A. J. Obermuller
Citrus	Inverness	17 Aug.	*T.s. ambigua*, 1M	D. C. Thurman, A. J. Obermuller
Duval	Jacksonville	22 May	*T.s. ambigua*, 1M	Dr. H. Hansen
Duval	Jacksonville	2 July	*T.s. ambigua*, 1M	Dr. H. Hansen
Levy	Chiefland	28 Aug.	*T.s. ambigua*, 2F	A. J. Obermuller
Levy	Otter Creek	24 Sept.	*T.s. ambigua*, 1F	A. J. Obermuller
Marion	Fairchild	— Aug.	*T.s. ambigua*, 1	D. C. Thurman

TABLE II.—Collection Records of *Triatoma* spp. in Florida, 1947.

County	Locality	Date	Species—Number and Stage	Habitat	Collector
Alachua	Cross Creek	5 May	*T.s. ambigua*, 1F	House	D. J. Taylor
Alachua	Wacahoota	29 Sept.	*T.s. ambigua*, 1M	Privy	D. J. Taylor
Dixie	Suwannee Gables	8 July	*T.s. ambigua*, 1M	House	D. J. Taylor
Dixie	Stuart	10 July	*T.s. ambigua*, 1M, 1F	House	D. J. Taylor
Duval	Jacksonville	2 July	*T.s. ambigua*, 1F	House	Poole
Gilchrist	Williford	5 Sept.	*T.s. ambigua*, 1F	House	D. J. Taylor
Hendry	Felda	18 June	*T.s. ambigua*, 3M, 5F	Chicken house	D. J. Taylor
Hendry	Felda	18 June	*T.s. ambigua*, 1M, 1F	House	D. J. Taylor
Hendry	Felda	3 July	*T.s. ambigua*, 3M, 3F	House	Mrs. A. Townsend
Hendry	Felda	11 Nov.	*T.s. ambigua*, 1M, 5F	House	D. J. Taylor
Jackson	Sneads	12 June	*T. sanguisuga* (subsp.) 1N	House	C. J. McLeod
Lafayette	Grady	9 Sept.	*T.s. ambigua*, 1M	House	D. J. Taylor
Lafayette	Steinhatchee River	10 Sept.	*T.s. ambigua*, 1M	House	D. J. Taylor
Leon	Lake Jackson	5 June	*T.s. ambigua*, 1M	House	C. J. McLeod
Levy	Rosewood	15 July	*T.s. ambigua*, 1M	House	D. J. Taylor
Levy	Englis	16 Oct.	*T.s. ambigua*, 3M	Barn	D. J. Taylor
Madison	Pinetta	20 Sept.	*T.s. ambigua*, 1F	House	D. J. Taylor
Madison	Cherry Lake	25 Sept.	*T.s. ambigua*, 1F	House	D. J. Taylor
Marion	Citra	17 July	*T. sanguisuga* (subsp.) 1N	Chicken house	D. J. Taylor
Marion	Evinston	24 July	*T.s. ambigua*, 1F, 1N	Storeroom Privy	D. J. Taylor
Pasco	Dade City	11 Aug.	*T.s. ambigua*, 1F	Privy	D. J. Taylor
Sumter	Rutland	2 July	*T.s. ambigua*, 1F	House	D. J. Taylor
Sumter	Coleman	2 July	*T.s. ambigua*, 1M	Spider Web	D. C. Thurman
Sumter	Bamboo	14 Aug.	*T.s. ambigua*, 1F	House	D. J. Taylor
Sumter	Bamboo	30 Oct.	*T.s. ambigua*, 1N (skin)	Privy	D. J. Taylor
Suwannee	Ft. Union	1 Oct.	*T.s. ambigua*, 1F	Barn	D. J. Taylor
Suwannee	Suwannee	1 Oct.	*T.s. ambigua*, 1F	House	D. J. Taylor
Taylor	Covington	26 May	*T.s. ambigua*, 1F	Privy	C. J. McLeod
Taylor	Clara	12 Sept.	*T.s. ambigua*, 1M, 1F	Privy, House	D. J. Taylor

Genus *Triatoma* Laporte

Key to Florida Species of Adult *Triatoma*

1.	Body naked	2
	Body pubescent	3
2.	Length more than 19 mm.	*sanguisuga*
	Length less than 19 mm.	*sanguisuga ambigua*
3.	Length 24 mm.	*lecticularius*
	Length 20 mm.	*lecticularius floridana*

No natural infections with *T. cruzi* (Chagas) have been reported for the species and sub-species known from Florida, although Packchanian (*3*) demonstrated that *T. sanguisuga ambigua* (Neiva) could be experimentally infected with *T. cruzi*.

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AN AGRONOMIZED LEAF-MINER AND ITS PARASITES

By JAMES G. NEEDHAM

In early December 1947 at the Archbold Biological Station, Florida, there appeared in great abundance on the leaves of the common weed *Bidens pilosa* the work of Dipterous leaf-miner that had before been noticed but sparingly. A few could be found on almost any *Bidens* clump, and half the leaves on some single plants were infested. Finding grown larvae in some of them, I spent about an hour collecting and selecting some fifty of them, and put them in a rearing jar, the issue from which I will here briefly relate.

By holding an infested leaflet to the light and looking through it with a lens I could see by transparency a Dipterous larva working within. That it was an Agromyzid larva was indicated by its manner of working. It lay on its side swinging its mouth-

hooks up and down in the plane of the leaf surface, tearing fresh leaf tissue on each down stroke, and thus liberating the sap for food. So it cut a swath as wide as the swing of its mouth-hooks. And it left in torn cell walls a record of its strokes like the slanting stubble in an oat field that has been mown by a scythe; all slant in the same direction, the swath crossed by parallel curving lines formed by successive strokes.

The mine is begun at the tip of a leaflet, and is continued, full depth, across the whole width of the leaflet for a third or a half of its length. The mine turns brown as fast as it is sucked dry and becomes shrivelled and more or less collapsed when completed.

I had hardly more than stocked my rearing jar when a few of the brood began to leave their mines to find a place for pupation. They were not hard to satisfy: almost any dry smooth surface would do. Some settled high, some low on the inner side of the glass jar, and some on the outside of the leaflets piled in the bottom.

Each larva emerged from its mine soft and sticky and nearly as shapeless as a shell-less egg. As it slid along to a place of pupation it seemed to be about to deliquesce and melt away; but when it stopped it quickly dried and hardened into a more or less loaf-shaped puparium closely adherent by the flat under surface. At first it was honey-yellow but soon it turned brown.

Four species of insects emerged from the mines in the rearing jar: one, the leaf-miner; the others, its parasites. These were preserved daily as they emerged, and sent to Dr. C. F. W. Muesebeck, to whom I owe my thanks for determination. They were the following:

Agromyza maculosa Malloch (det. C. T. Greene). Dr. Greene states that *Bidens pilosa* is a new host plant for this species.

Chrysocharis sp? (*Eulophidae* det. A. B. Gahan). A single specimen; emerged December 23, 1947.

Opius n. sp. and *Oenonogaster* n. sp. (*Braconidae* det. C. F. W. Muesebeck; numerous specimens). Dr. Muesebeck says that the two are certainly undescribed. Emergences of the Agromyzas and of these Braconid parasites occurred on January 8th, 10th, 12th and 14th, 1948, and these parasites were somewhat more numerous than the flies that make the mines.

Evidently I had come upon an upsurge of parasitism, for shortly thereafter and for the three months of my subsequent stay at the Archbold Laboratory, hardly a single leaf mine of

this species could be found. The Braconids seem to have destroyed their own food supply.

Specimens of the parasites are in the United States National Museum awaiting description.

THE PROGRESS OF ENTOMOLOGY

W. G. BRUCE
United States Department of Agriculture
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Bureau of Entomology and Plant Quarantine

The present widespread interest in entomology is a direct result of the excellence of the work done by entomologists in the war effort. The urgent demands for more effective methods and materials for controlling insects, especially insect vectors of disease (malaria, yellow fever, epidemic typhus, tsutsugamushi fever, etc.), accelerated research in entomology and the discovery and development of new and remarkable insecticides. Certainly the entomologist had no small part in shortening the duration of the war. By reducing the loss of life and man-hours caused by insect-borne diseases and by preventing insect damage to food, clothing, and other property, the entomologist played a very important part in winning the war.

It is needless to enumerate each and every contribution made by the entomologists during the war or to discuss in detail each important insect-borne disease, its vector, and its control, for all this has been given adequate publicity and is now common knowledge. Suffice to say, the entomologists can be justly proud of their part in the war effort.

For many years prior to the war, entomology was looked upon with polite tolerance. It has now reached the eminence of other learned professions, commands their respect, and enjoys their cooperation. In recent years the general public has become more "insect conscious" and realizes more than ever before the importance of insect control.

To the early entomologists, especially the older members of our entomological organizations, goes much of the credit for the present status of our profession. With devotion to duty, sincerity of purpose, and keen foresight, they banded together for the betterment of the individual, the interchange of technical information, the cementing of friendships, and the planning for the future. They formed societies and struggled through

the lean years to hold their organizations together. It was these scientists who, in time of emergency, were prepared and ready to solve the momentous problems with which they were confronted. It is only fitting that tribute be paid to the founders and former officers of the Florida Entomological Society for their devotion to and foresight in the field of entomology, for their part in building this Society, for their inspiration to the younger entomologists, and for their part in elevating the science of entomology to its present level.

But their work is by no means completed. Their long and diversified experience is needed to guide and stabilize the Society through the coming years. Their inspiration is still needed by their co-workers and by the younger entomologists. There are many problems yet to be solved, and their solution is demanded by the public in its desire for more effective methods of controlling insect pests.

We are on the threshold of a new era for entomology, an era that demands creative thought, intensive research, more extension service, better organization, more accurate insect surveys, more adequately trained entomologists, more cooperation between research personnel and those with the Extension Services, the Public Health Service, industry, and commercial entomologists.

Research in entomology, having profited by the war experience, appears to be on a sound footing. Its progress is limited only by inadequate funds and insufficient personnel. Many insect problems still await the attention of the research worker. Some new insect pests present new problems. Some of the old control measures need improvement. Numerous new insecticides—particularly DDT, TDE, chlordane, benzene hexachloride, chlorinated camphene, and parathion—must be tested for toxicity to the insect and to the host animal or plant. The fields of chemotherapy and insect transmission of disease offer unlimited opportunities to the research entomologist.

Those of us who are interested in insects affecting livestock should devise an insect-control calendar for stockmen—a calendar of the various ectoparasites of livestock, the materials and methods for control, and the approximate dates for treatment. Insect incidence and abundance and climatological conditions vary in different parts of the United States, and therefore different schedules must be formulated to apply to different sections of the country.

We are thinking today, more than ever before, in terms of insect eradication. Even if the eradication of some insects may not appear feasible today, it is time to think of eradication, to learn enough about the insect and its control to justify such a program. Screwworms, the most destructive insect pest affecting livestock in Florida, can be eradicated from the Southeast, and that region can be kept free of reinfestation. It is not unreasonable to assume that, with our present knowledge and present methods of control, cattle lice and horn flies can be eradicated in some of the States where livestock is a highly organized industry, and where the cooperation of the stockmen can be assured.

Yes, there are plenty of opportunities for the reasearch entomologist who has the initiative and the ability for creative thinking, backed by adequate training in entomology and related subjects.

The Extension Services in the various States are now taking a keen interest in entomology, and during the past two or three years they have done their greatest work in this field. It is apparent that these Services could be, and certainly should be, important factors in the development of practical insect control. They are in a position, not only to distribute information concerning insect control, but actually to demonstrate to farmers and stockmen that insect control is both practical and profitable. Too often, heretofore, the results of good research have been buried in isolated reports and publications while the would-be beneficiaries still struggled with problems already solved. Today the Extension Services in many States are keeping pace with the rapid strides in entomological research, and not only promptly relay the new information to the citizens, but by lectures and demonstrations teach the new and improved methods of insect control. Crop dusting and the spraying of livestock are only two of the many examples that could be cited. You have had some excellent examples of livestock spraying here in Florida. More of this type of work must be done if the fruits of research are to be properly harvested. Extension Services should make an effort to maintain the present interest in entomology, to have at least one extension entomologist in each State, to give some entomological training to all county agents, and to cooperate closely with research entomologists.

Cooperation between Federal and State agencies, and of these agencies with the Extension Service and industry, is of

prime importance for the best interests of research and extension. This close cooperation is rapidly becoming a reality. About one year ago two significant conferences were held—one at Oklahoma City, Oklahoma, and the other at Cheyenne, Wyoming—at which representatives from all States west of the Mississippi River, with the exception of Minnesota and California, met to discuss the control of insect pests affecting livestock. The State representatives included entomologists, veterinarians, and animal husbandmen in the fields of research and extension. The United States Department of Agriculture was represented by both research and extension workers. The conferences were informal and permitted a thorough discussion of all problems in veterinary entomology that are important in that section of the country. The information presented was carefully analyzed and control recommendations were formulated. Recommendations were also made for additional research and extension. The success of these conferences was indicated by the enthusiastic participation of all the representatives and by the unanimous opinion that such conferences should be annual events.

Just last month a similar and very successful conference was held at Atlanta, Georgia. Research and extension representatives came from Florida, Georgia, Alabama, Mississippi, Louisiana, Kentucky, Tennessee, South Carolina, and North Carolina. The United States Department of Agriculture was represented by members of the Bureau of Entomology and Plant Quarantine, the Bureau of Animal Industry, and the Extension Service. Sectional conferences of this nature should be held each year and in such locations as to encompass the entire United States.

More active insect pest surveys, by the employment of full-time scouts, would aid materially in reducing the losses due to insect attack. Funds expended in this enterprise should result in savings far in excess of the cost of such a project. This information would provide a basis for the forecasting of outbreaks and help in the detection of new insect pests before they become established. It would thereby enable farmers and stockmen to make accurate estimates of the amounts of critical materials needed, and to obtain insecticides and equipment for controlling the pests before they do serious injury. These scouts could perform another valuable service by collecting data on the actual losses of animals due to insect attack. Many of our present estimates on losses caused by insects are mere guess-

work. We need more facts if we are to evaluate these losses correctly.

The enforcement of our present quarantines to prohibit or regulate the importation or interstate movement of injurious insects must be continued. This phase of enomological work has become more complicated by the tremendous increase of air traffic into the United States, and we must continue to be on the alert for immigrant pests.

This discussion briefly reviews the present status of entomology and looks toward the distant horizon. We cannot rest on our present laurels. There are many problems to be solved. It is up to the entomologists to carry on. To the older entomologists we can truthfully say—"Well done, good and faithful servant"—and to the younger entomologists may we suggest—"Go thou and do likewise."

RESULTS OF TESTS MADE WITH SOME NEWER INSECTICIDES FOR THE CONTROL OF THE RED HARVESTER ANT

Pogonomyrmex barbatus (F. Smith)

PAUL T. RIHERD

Assistant Entomologist, Texas Agricultural Experiment Station

A test was conducted from July 30, 1947 to October 23, 1947, to determine if some of the newer insecticides could be used as a simplified control for the red harvester ant, *Pogonomyrmex barbatus* (F. Smith). The materials used were in dust form, and included the following insecticides: 6% benzene hexachloride (gamma isomer), 5% DDT, 5% chlordane, and 20% chlorinated champhene (Toxaphene).

Strong, well established colonies located in a typical Texas Gulf Coast pasture were selected for the test. Five colonies were treated with each material. The treatments were made by applying approximately one ounce of the dust over the mound around the entrance to the nest by hand in such a manner that the ants leaving or entering the nest would have to pass through the insecticide. The dusts were applied by taking the dust in the hand and strewing it in the manner of sowing seed broadcast, starting at the entrance and extending outward allowing enough dust to just cover the surface of the soil. Each nest

was treated five times during the test. Observations of the nests were made at times when untreated colonies showed normal activity.

The results of the treatments were determined by making observations of the nests and recording the activity of the ants at each nest. Colonies with no activity were scored 1; colonies with one to fifty ants present 2; colonies with more than fifty ants but showing a definite weakened condition were scored 3; and colonies where little or no decrease in the strength of the colony was evident were given a rating of 4. Hills with fresh-dead ants present about the nest were recorded.

A summary of the data gathered from these tests is presented in the accompanying Table. It was observed that all activity at some nests ceased on the second or third day after treatment and remained inactive from three to five days. Kicking into these hills disclosed many unaffected ants.

The duration of the test was 83 days. At the end of the test no colonies had been eradicated. Of the five colonies treated with 6% benzene hexachloride, three were in a weakened condition, and two with very little activity. Fresh-dead ants were present at one nest on October 22, twelve days after the last treatment. Of the five colonies treated with 5% DDT three showed little or no decrease in the strength of the colonies, and two in a definitely weakened condition. Fresh-dead ants were present at one nest on August 8, eleven days after treatment. At the end of the test the colonies treated with 20% *Toxaphene* showed three colonies in a weakened condition, one with very little activity, and one with little or no decrease in the strength evident. Fresh-dead ants were present at one nest on October 22, fourteen days after treatment. On October 8, thirty-three days after the last previous treatment fresh-dead ants were present at three hills, one of which showed no activity. No unaffected ants were revealed by kicking into the mound.

Many dead ants were present about all the nests treated the day after the first applications were made. Observations were not made the first day after subsequent applications.

RESULTS OF TREATMENTS OF COLONIES OF THE RED HARVESTER ANT WITH INSECTICIDAL DUSTS.

Date		6% BHC					5% DDT					5% Chlordane					20% Toxaphene				
		Nests					Nests					Nests					Nests				
Treated	Observed	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
7/30	8/1	2*	3*	2*	3*	1*	3*	3*	3*	3*	3*	2*	2*	2*	2*	2*	2*	2*	1*	2*	2*
7/30	8/11	3	4	3	3	3	4	3	3	4	3	2	3	3*	3	3	3	3	3	3	3
8/11	8/30	3	4	4	3	4	3	3	3	4	3	3	3	3	3	3	4	3	4	4	3
8/30	9/5	3	3	3	3	3	2	3	3	3	3	2	2	3	3	3	3	2	3	3	3
9/5	10/8	3	4	2	3	3	3	4	3	3	3	3	3	2	3	3	1*	2	2*	2*	2
10/8	10/22	3	3	2	2*	3	3	4	4	4	3	3	3	3	3	2	3	4	3	3*	2

* Fresh-dead ants present when observation made.
1 No activity of colony.
2 Very little activity (1 to 50 ants present).
3 Colony active but definitely weakened.
4 Little or no decrease in strength of colony evident.

THE RED STENODYNERUS OF FLORIDA
(Hymenoptera, Vespidae)

By RICHARD M. BOHART
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The genus *Stenodynerus* Saussure is represented in Florida by 17 known species and subspecies including 5 described in this paper. They are not closely related within the genus but 14 of them have in common a characteristic type of dull red markings associated with a distribution limited to southeastern United States or to Florida alone. Most of these red-marked forms are merely subspecies of more widely distributed yellow-marked forms occurring to the north and west. The only exceptions appear to be *histrio, australis, beameri* and possibly *bifurcus*. The last named seems very close structurally to *S. pedestris* (Saussure) and may be a subspecies of it.

The red-marked *Stenodynerus* of Florida are abundant and constitute an outstanding part of the endemic fauna. Indeed, it is almost always possible to recognize a Florida specimen by its markings without determining the species. Two other areas in which the solitary vespids can be used as indicators are Lower California, where reduced punctuation is the rule, and the Hawaiian Islands where black is the predominant color. In addition to *Stenodynerus* many other Floridan vespids,[1] sphecoids, bees, and even some flies exhibit the same shade of red.

The collections examined which contained appreciable numbers of Florida material were in the U. S. National Museum, Museum of Comparative Zoology at Harvard, Academy of Natural Sciences at Philadelphia, American Museum of Natural History, California Academy of Sciences, Cornell University, and University of Kansas. In addition, my brother, G. E. Bohart, and I collected several hundred specimens in the vicinities of Cocoa and Orlando.

KEY TO THE RED-MARKED STENODYNERUS OF FLORIDA

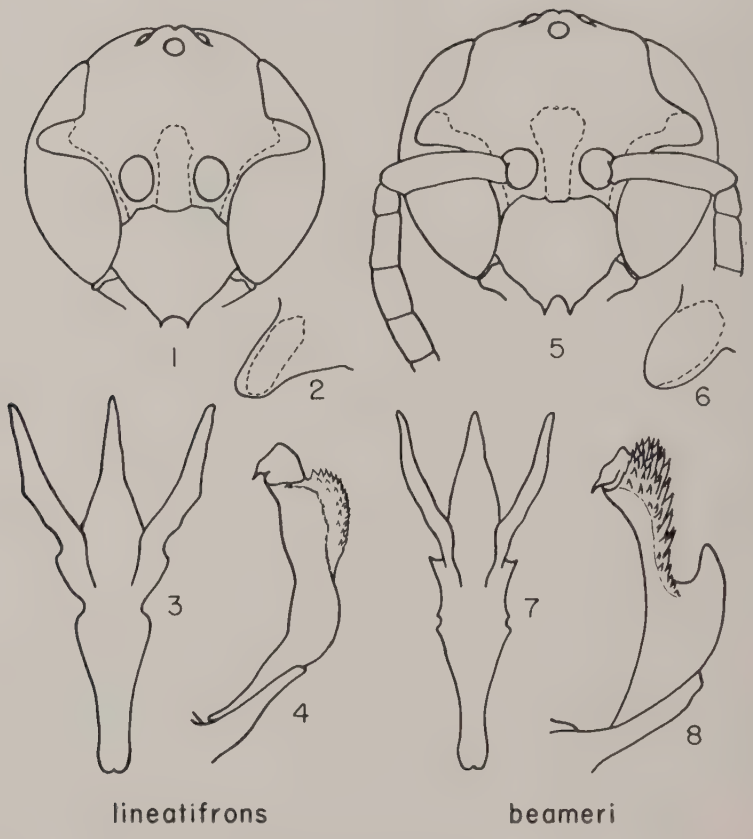
1. Parategulae slender, somewhat to strongly incurved along oblique inner margin,[2] and usually hooked or pointed toward apex..... 2

[1] Examples are *Eumenes smithii* Saussure, *Leptochilus tylocephalus* (R. Bohart), *Rygchium foraminatum apopkense* (Robertson), *Pachodynerus erynnis* (Lepeletier), and *Zethus slossonae* Fox.

[2] The parategula is the mesonotal projection directly behind the tegula; it is usually colored but its edge is membranous and the margin is outside the colored portion.

Parategulae broadened, outcurved or at least straight along oblique inner margin, usually broadly rounded at apex 7

2. Intercellar area with tubercles, which may be weakly developed; interantennal spot linear, not much broadened above 3
Interocellar area flat or concave, without tubercles; interantennal spot sometimes broadened above 5



EXPLANATION OF FIGURES

Figs. 1-4, *Stenodynerus lineatifrons* Bohart, holotype male, front view of head, parategula, flattened aedeagus, and extension of paramere, respectively.

Figs. 5-8, *Stenodynerus beameri* Bohart, holotype male, front view of head, parategula, flattened aedeagus, and extension of paramere, respectively.

3. Summit of tergite I without a transverse ridge; tergite III apically banded and tergite II spotted, at least in male; interocellar tubercles weak, propodeum not forming a horizontal shelf behind postscutellum; male with mid femur toothed, hind femur somewhat swollen, and antennal hook stout ..... *fundatiformis* (Robertson)
Summit of tergite I with a transverse ridge; tergite III and those following dark, tergite II unspotted; propodeum forming a distinct horizontal shelf below postscutellum, legs of male not modified as above, antennal hook slender 4

4. Acarinarium present beneath lengthened apex of tergite II; sculpture very coarse, punctures of mesonotum nearly as large as ocelli; longitudinal ridges at base of sternite II separated by about 2 ocellus diameters near middle of body; male mid femur not depressed beneath at base; tergite II frequently all dark....*histrio* (Lepeletier)
Acarinarium absent; sculpture less coarse, punctures of mesonotum much smaller than ocelli; generally not more than one-half as large; longitudinal ridges at base of sternite II separated by little more than 1 ocellus diameter near middle of body; male mid femur depressed beneath at base; tergite II apically banded (figures 1-4) ..... *lineatifrons* R. Bohart

5. Sternite II bent outward near base as seen in profile, without a median crease; acarinarium present; male antennal hook black; tergite II unspotted ..... *perennis anacardivora* (Rohwer)
Sternite II evenly convex in profile, with a median basal crease; acarinarium absent; male antennal hook brown or red 6

6. Tergite I with a distinct, irregular, transverse ridge across its summit; clypeus spade-like, truncate apically; male with mid femur somewhat distorted; ocelli normal, sternite II trituberculate ..... *clypeolatus floridanus* Robertson
Tergite I somewhat roughened at summit but not ridged; clypeus not spade-like; male with ocelli larger than usual, sternite II and mid femur normal ..... *australis* (Robertson)

7. Without an acarinarium beneath apex of tergite I, juncture of I and II marked at least laterally by a transverse row of pit-like depressions; no smooth, raised area on either side of tergite I behind summit; interocellar area with tubercles; flagellum of male usually pale beneath almost to apex 8
With an acarinarium beneath lengthened apex of tergite I, juncture of I and II smooth 11

8. Sternite II with coarse punctures toward basal middle; male clypeus coarsely punctured and sharply incised at apex, female unknown (figures 5-8) ..... *beameri* R. Bohart
Sternite II rather finely punctured toward basal middle; male clypeus moderately incised at apex 9

9. Tergite I without a row of large punctures across summit; sternite II with preapical pale spots which may be very large, apical band complete; segments III and following, or some of them, yellow-marked ..... *oculeus* (Robertson)

Tergite I with a row of large punctures across summit; sternite II without preapical pale spots; segments II and following dark.... 10

10. Interantennal spot narrowly wedge-shaped, often linear; male clypeus rather coarsely punctured, apex broader than median ocellus (figures 1-4) ..... *lineatifrons* R. Bohart

Interantennal spot broadly wedge-shaped, not linear; *clypeus* unusually long and apically narrowed in both sexes, that of male rather finely punctured, apex about as broad as median ocellus ..... *ammonia* (Saussure)

11. Tergite I not as broad as length of II beyond acarinarium; ridge across summit of tergite I low but fairly distinct, without a smooth raised area on either side behind summit; interocellar tubercles low and narrow; mid femur of male with a definite basoventral depression ..... *bifurcus* (Robertson)

Tergite I about as broad as length of II beyond acarinarium; tergite I usually with a smooth, pale-marked raised area on either side behind summit; mid femur of male not depressed basoventrally.... 12

12. Tergite I with numerous silky hairs of 1 to 3 ocellus diameters in length located at summit and extending back at least to middle of horizontal surface 13

Tergite I without long hairs or with a few moderate ones near summit only 14

13. Interocellar tubercles present, rather low in female but bulging in male; longer hairs of tergite I becoming sparse towards apex of segment; male ocelli small, front ocellus about one-half as broad as interantennal area and separated by about twice its diameter from lateral ocelli ..... *bicornis* (Robertson)

Interocellar area somewhat raised and shiny but not tuberculate; longer hairs of tergite I thick toward apex of segment; male ocelli large, front ocellus as broad as interantennal area and separated by about its diamter from lateral ocelli ..... *saecularis rufulus* R. Bohart

14. Tergite I with a strong ridge across summit; tergite II without an entrance depression to acarinarium, unspotted; male clypeus sparsely punctured, weakly incised apically; flagellum broadly red on basal half in both sexes ..... *fulvipes rufovestis* R. Bohart

Tergite I without a ridge or large punctures across summit; tergite II with an entrance depression to acarinarium (visible only when II is bent at an angle with I); male clypeus coarsely punctured and very deeply incised apically;[3] flagellum mostly black..... *vagus slossonae* R. Bohart

Stenodynerus (Stenodynerus) fundatiformis (Robertson)

Odynerus fundatiformis Robertson, 1901. Trans. Amer. Ent. Soc. 27: 197. Male, Inverness, Florida.

[3] Male character taken from specimens of typical *vagus*.

SPECIMENS STUDIED.—*Florida:* Titusville, DeFuniak Springs, Sanford, Suwannee Springs, Cocoa, Fort Mead, Hilliard, Fruitville, Branford, Lacoochee, Lamont, Naples, Blountstown, Mulberry, Fort Worth; *Alabama:* Mobile; *Missouri:* Brandon; *Arkansas:* Fort Smith; *Texas:* Frio County; *Mississippi:* Orange Grove; *Georgia:* Valdosta, Wadley, Okefenokee Swamp, Prattsburg; *South Carolina:* St. Mathews.

Stenodynerus (Stenodynerus) oculeus (Robertson)

Odynerus oculeus Robertson, 1901. Trans. Amer. Ent. Soc. 27: 197. Male, female, Orlando, Florida.

SPECIMENS STUDIED.—*Florida:* Inverness, Hilliard, Dade City, St. Petersburg; *Georgia:* Okefenokee Swamp.

Stenodynerus (Stenodynerus) australis (Robertson)

Odynerus australis Robertson, 1901. Trans, Amer. Ent. Soc. 27: 197. Male, female, Inverness, Florida.

SPECIMENS STUDIED.—*Florida:* Inverness, Lacoochee, Orlando, Palm Beach, Sanford.

Stenodynerus (Stenodynerus) beameri, new species

MALE.—Black, deep yellow and reddish. Deep yellow or orange-yellow are: mandible mostly, clypeus, scape in front, inner surface of flagellum, lower orbit, interantennal line broadened above, postocular spot, 2 barely joined humeral spots, tegula, spot beneath, parategula, postscutellum mostly, propodeal angles largely, legs partly, abdominal tergite I except for basal slope and small triangular spot along summit (absent in one paratype, small in another), apical margins of tergite II broadly, tergite IV very weakly and sternite II. Brownish red are: Legs partly, basal slope of tergite I partly, free lateral spot on tergite II (absent in paratypes), large spots at base of sternite II. Wings deeply brown stained and somewhat violaceous. Pubescence short and inconspicuous. Punctuation moderate to coarse. Punctures of clypeus deep and rather close, those of front and mesonotum coarse and close, those of propodeum above pit-like, those of horizontal surface of tergite I coarse and close, becoming larger toward summit where they form a poorly defined ridge, those toward apex of tergite II very coarse and somewhat elongate in a cribrose band. Front of head and parategula as in figs. 5 and 6; last antennal segment somewhat flattened, curved, reaching base of tenth; interocellar area with narrow tubercles not bridged over front ocellus; indistinct ocular swellings present; propodeum forming a narrow but distinct shelf behind postscutellum; pits across base of tergite II becoming obsolete medially; tergite II with an oblique apical reflex of 1.5 ocellus diameters (1 to 2 in paratypes); sternite II rather evenly convex and with a basomedian crease; genitalia as in figs. 7 and 8, aedeagus with sharp median expansion and notched

submedian expansion, extension of paramere peculiar in form. Length to apex of second tergite 7.0 mm.

HOLOTYPE, male, Hilliard, Florida, August 19, 1930 (R. H. Beamer). PARATYPE, 2 males, Gainesville, Florida, October 2, 1914. Type in collection of University of Kansas.

Externally, *beameri* resembles closely the more yellow northern specimens of *S. (Parancistrocerus) bifurcus* (Robt.). The acarinarium under the slightly lengthened tergite I of the latter and the fact that the first flagellar segment is distinctly longer than the next 2, instead of nearly equal as in *beameri* can be used for separation characters. However, the male genitalia of *beameri* are unique.

Stenodynerus (Stenodynerus) lineatifrons, new species

MALE.—Black, deep red and dull yellow. Red are: mandible at tip, basal 3 antennal segments, flagellum beneath as far as tenth segment, lower orbit, postocular spot, 2 nearly confluent humeral spots, tegula, spot beneath, parategula, postscutellum, horizontal surface of tergite I and sternite I. Clypeus yellow. Dull reddish yellow are: linear interantennal mark, legs except for coxae partly, narrow apical bands of tergites I and II, and sternite II. Wings brownish, slightly violaceous. Pubescence short, fulvous on vertex and notum, silvery on clypeus, pleuron and abdomen. Puncturation moderate on clypeus, coarse and fairly close on front, mesonotum, and tergite I except for dark basal part; an undulating row of large shallow punctures across summit of tergite I outlining an indistinct ridge, propodeum with pit-like punctures above. Punctures of tergite II coarse but well spaced, becoming a little larger and closer just before apex. Front of head and parategula as in figs. 1 and 2, in some male paratypes parategula has a broader membranous inner (posterior) margin; last antennal segment rather cylindrical, curved, reaching apex of tenth; interocellar area with 2 smooth tubercles which are not bridged over front ocellus; humeral angles weak, propodeum forming a distinct rough shelf below postscutellum. Mid femur with a basal depression beneath; tergite I more than half as long as broad in dorsal view; tergite II with apical reflex less than 1 ocellus diameter; sternite II with a median basal crease. Extension of paramere with a large many-toothed basal crest (fig. 4), aedeagus as in fig. 3. Length to apex of second tergite 7.5 mm.

FEMALE.—Mandible and legs mostly reddish, first 4 antennal segments red, a few others partly reddish, propodeum with a red lateral spot, a small lateral spot sometimes present on tergite II, clypeus with a curved reddish spot on basal one-third, orbital dots present. Vertex pit about as large as on ocellus. Length to apex of second tergite 9.0 mm.

HOLOTYPE, male, Jacksonville, Florida (W. H. Ashmead). PARATYPES, 4 males and 11 females from the following Florida localities: Jacksonville (W. H. Ashmead), Orange Co. (W. A. Hier), Palm Beach, Cocoa (G. Bohart). One female paratype, Carolina Beach, North Carolina (F. S. Blanton); 1 female paratype, McClellanville, South Carolina (H. K. Townes). Paratypes were collected from May through July. Type in U. S. National Museum.

This species resembles *ammonia* (Saussure) and *australis* (Robertson) but differs from both of these in that the basal part of tergite I is dark. Also, the parategulae are narrower than in *ammonia* and the frontal mark in *lineatifrons* is narrow instead of widened above as in the other 2 species.

Stenodynerus (Stenodynerus) ammonia (Saussure)

Odynerus ammonia Saussure, 1853. Etudes sur la Familles des Vespides 1: 144. Female, "Carolina".

SPECIMENS STUDIED.—*Florida:* Cocoa, Royal Palm, Cudjoe Key, Charles Harbor, Lacoochee, Cedar Keys, Hilliard, Orlando, Capron, Jacksonville, Vilano Beach, Lower Matecumbe Key, Naples, Gainesville.

Stenodynerus (Stenodynerus) clypeolatus floridanus (Robertson)

Odynerus floridanus Robertson, 1901. Trans. Amer. Ent. Soc. 27: 197. Female, Inverness, Florida.

SPECIMENS STUDIED.—*Florida:* Charles Harbor, Palm Beach, Gladeland, Vero Beach, Cocoa, Miami, Brighton, Lower Matecumbe Key, Inverness.

Stenodynerus (Parancistrocerus) vagus slossonae, new subspecies

FEMALE.—Marked as in typical *vagus* Saussure but with yellow markings replaced by orange or dull red. Reddish are: mandible, antenna toward base beneath, clypeus across base, interantennal and orbital spots, postorbital spot, pronotal spot, tegula, spot beneath, parategula, postscutellum, sides of propodeum, legs mostly, apical margin of tergites I and II, that of I attached to large oblique spot on summit, free lateral spot on tergite II, lateral apical spot on sternite II. Wings brownish. Structure as in typical *vagus* with robust form, stout parategula, short tergite II with a median entrance to acarinarium, and narrowly excavated clypeal apex. Length to apex of second tergite 10 mm.

HOLOTYPE, female, Atlantic Beach, Florida (A. T. Slosson). PARATYPE, female, Florida. Type in U. S. National Museum.

Although the male is unknown, it should be easily recognized by the deep apical incision and spine-like apical teeth of the clypeus which are characteristic of the species. Also, it should have the acarinarium entrance found only in *vagus* in North American *Parancistrocerus*.

Stenodynerus (Parancistrocerus) bicornis (Robertson)

Odynerus bicornis Robertson, 1901. Trans. Amer. Ent. Soc. 27: 196. Male, female, Inverness, Florida.

SPECIMENS STUDIED.—*Florida:* Inverness, Orlando.

Stenodynerus (Parancistrocerus) bifurcus Robertson

Odynerus bifurcus Robertson, 1901. Trans. Amer. Ent. Soc. 27: 196. Male, female, Inverness, Florida.

SPECIMENS STUDIED.—*Florida:* Inverness, Gainesville, Orlando, Tallahassee, Crescent City, Sanford, St. Johns River, Cocoa, Plant City, Moore Haven; *Georgia:* Okefenokee Swamp.

Stenodynerus (Parancistrocerus) perennis anacardivora (Rohwer)

Odynerus anacardivora Rohwer, 1915. Proc. U. S. Nat. Mus. 49: 241. Female, Miami, Florida.

SPECIMENS STUDIED.—*Florida:* Fort Myers, Long Key, Gainesville, Maimi, Indian River, Englewood, Mayport, Jacksonville, Palm Beach, Enterprise, Orlando, Tallahassee, Flamingo, Cocoa, Upper Matecumbe Key, Goulde, St. Petersburg; *Georgia:* Atlanta; *North Carolina:* Raleigh; *Louisiana:* New Orleans.

Stenodynerus (Parancistrocerus) histrio (Lepeletier)

Odynerus histrio Lepeletier, 1841. Hist. Nat. Ins. Hym. 2: 638. Male, "Carolina".

SPECIMENS STUDIED.—*Florida:* Indian River, Haulover, Aucilla River, Royal Palm Park; *Georgia:* Brunswick; *Louisiana*; *Virginia:* Camp Peary; *District of Columbia.*

Stenodynerus (Parancistrocerus) fulvipes rufovestis new subspecies

MALE.—Black, dull red and yellow. Clypeus yellow; Y-shaped interantennal mark, mandible spot and lower orbit orange-yellow; apical bands on tergites I and II and sternite II, spot on tegula, parategula, legs partly, scape in front dull orange yellow. Dull red are: basal 4 flagellar segments entirely, next 3 beneath, mandible tip, postocular spot, emarginate humeral band, narrow hind pronotal margin, tegula mostly, spot beneath, band across postscutellum, large lateral spot on tergite I attached to apical band, legs mostly. Deep red are: propodeum, sternite I, tergite I before summit ridge. Wings dusky with violet reflections. Length to apex of second tergite 8 mm.

FEMALE.—Clypeus with a basal curved reddish mark, interantennal spot abbreviated, ocular dot and red mesonotal spot present. Length to apex of second tergite 9.0 mm.

HOLOTYPE, male, Orlando, Florida, March, 1944 (R. and G. Bohart). PARATYPES, 47 males and 13 females from the following Florida localities: Orlando, Cocoa, Palatka, Upper and Lower Matecumbe Key, Key Largo, Everglades, St. Petersburg, Indian River, Key West, Cedar Key, Fruitville, Apalachicola, La Belle, Punta Rassa, and Arcadia. I have also seen a female specimen from McClellanville, South Carolina. Paratypes were collected from March to August. Type in U. S. National Museum.

Structurally *rufovestis* appears identical to *fulvipes* (Saussure). It has interocellar tubercles, relatively narrow male clypeus, broad but tapering parategulae, propodeum in a shelf below postscutellum, prominent ridge across summit of tergite I and no free spots on tergite II. It appears to be restricted mainly to central and south Florida but intermediate specimens are found occasionally as far north as Washington, D. C.

Stenodynerus (Parancistrocerus) saecularis rufulus new subspecies

MALE.—Black, marked with orange yellow and reddish. Orange yellow are: mandible mostly, clypeus, lower orbit, wedge-shaped interantennal spot, scape in front, legs partly, apical bands on tergites I and II and sternite II. Orange red are: scape behind, pedicel, flagellum beneath at base, postocular spot, 2 humeral spots, tegula partly, spot beneath, parategula, postscutellar band, propodeum partly, spot along summit, sternite I. Wings brown stained, somewhat violaceous. Pubescence pale grey to fulvous, mostly rather sparse but longer and more prominent than usual; that on dorsum of thorax, near summit of tergite I and at basal middle of sternite II as long as 1.5 ocellus diameters. Puncturation moderately coarse, well spaced on clypeus; tergite I with a row of shallow punctures following a well-defined ridge across summit. Vertex with smooth area present near compound eye, clypeus angularly incised at apex; parategula rather broad; interocellar area punctured, not raised above ocelli which are large with a diameter about as great as length of pedicel; propodeum with a weak shelf below postscutellum; tergite I nearly as broad as II in top view; tergite II apically reflexed about ½ ocellus diameter; sternite II with a shallow basomedian crease. Length to apex of second tergite 8.0 mm.

FEMALE.—Markings often more extensively orange red instead of orange yellow. Clypeus with a curved basal mark of red or orange; ocular and mesonotal dots present, spots sometimes present between ocelli and compound eye; tergite IV sometimes banded; sternite II sometimes with apicolateral spots instead of band. Vertex depression angled behind, as broad as 2 ocellus diameters; ocelli smaller than in male, diameter of hind ocellus ⅔ pedicel length. Length to apex of second tergite 9.5 mm.

HOLOTYPE, male, Orlando, Florida, May 21, 1925 (O. C. McBride). PARATYPES, 2 males and 8 females from the following Florida localities: Waldo (R. H. Beamer, J. Nottingham), Jacksonville (W. H. Ashmead), No Name Key (G. N. Collins), Dunnellon (D. E. Hardy), Davenport and Wildwood (J. Nottingham), Homestead (J. C. Bradley), Tampa and Miami. Type in U. S. National Museum.

A nearly mature male from Orlando, Florida, (D. J. Nicholson) bears the data "reared from oak galls on scrub oak."

The extensive reddish markings distinguish this subspecies from typical *saecularis* Saussure which occurs along the eastern seaboard from Georgia to New Jersey and in Texas.

INSECTICIDE STUDIES ON CHINESE CABBAGE FOR THE CONTROL OF THE TURNIP APHID, *Rhopalosiphum pseudobrassicae* (Davis) AND CERTAIN FOLIAGE FEEDING LARVAE

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A number of serious insect pests attack Chinese cabbage in the peat and muck soils of the Florida Everglades. Seldom is this vegetable grown without moderate to severe infestations of aphids, and several important leaf feeding larvae often attack the crop. The habit of growth of the Chinese cabbage plant is such as to make insect control difficult, especially after heading begins. The tight fitting, upright, cupped leaves offer protection to insects from applications of spray materials. If insects are present even in moderate numbers, many heads of cabbage are not marketable, and a large number must be stripped severely to remove the infested leaves. Since aphids constitute the most serious insect pest of the crop in this area, an experiment was conducted at the Everglades Experiment Station for the purpose of testing some of the new insecticides for their effectiveness against these pests, and to compare them with standard aphicides. Cutworms, predominately the black cutworm, *Agrotis ypsilon* (Rott.); the fall armyworm, *Laphygma frugiperda* (A. & S.); and the cabbage looper, *Trichoplusia ni* (Hbn.) appeared in the plots and a record of the performance of the treatments on these insects was obtained.

METHODS AND MATERIALS.—The plot area was plowed, disced, leveled and mole drained. Soil reaction determinations showed

the need for sulfur, and an application of 750 pounds per acre was broadcast with a mechanical distributor. One thousand pounds per acre of an 0-12-16 commercial fertilizer with secondary elements was applied at the same time and in the same manner as the sulfur, and these materials were disced into the soil 16 days before drilling the cabbage seed. The seed was planted on November 14 with a mechanical seeder in rows spaced 30 inches apart. Four 30 foot rows, separated from other plots by 8 foot alleys parallel to the rows, and by 5 foot alleys between plots perpendicular to the rows, made up each plot. Two buffer rows were planted parallel to the plot rows at each side of the plot area. Each treatment was replicated 5 times in a randomized block design. The following treatments were made:

1. DDT 5 percent by weight of technical DDT dissolved in a refined petroleum oil base.
2. DDT 25 percent emulsion—1 quart per 100 gallons water.
3. Benzene hexachloride 50 percent wettable containing 6 percent gamma isomer—3 pounds per 100 gallons water.
4. Benzene hexachloride dust—1.5 percent gamma isomer, carrier inert.
5. Benezene hexachloride wettable—25 percent gamma isomer—1 pound per 100 gallons water.
6. Hexaethyl tetraphosphate—50 percent—1 pint per 100 gallons water.
7. Parathion—15 percent wettable—1 pound per 100 gallons water.
8. Parathion—1 percent dust, carrier inert.
9. Nicotine sulphate—40 percent nicotine—1½ pints per 100 gallons water.
10. Nicotine alkaloid—80 percent nicotine—1 pint per 5 gallons refined petroleum oil base.
11. Pyrethrum (0.4 percent pyrethrins) plus Rotenone (2.5 percent extract) 1 pint per 100 gallons water.
12. Check, no treatment.

A commercial spreader-sticker was added to all water spray materials. The sprays were applied at the rate of 150 to 200 gallons of diluted spray per acre with a power sprayer using 100 pounds pressure for the first 2 applications and 300 pounds pressure for the third application. A 3 nozzle boom was used for all treatments. Dust applications were made with a rotary hand duster, at 30 to 40 pounds of dust per acre. The 2 oil based insecticides were applied at the rate of 1½ to 2 gallons per acre with a specially designed applicator constructed by

Mr. John W. Randolph, Agricultural Engineer, Everglades Experiment Station. The dusts were applied in the early morning when dew was on the plants and all other treatments were made when the foliage was dry. Insecticide applications were made on December 9, 16, and 30. The first application was made after a large number of winged aphids had infested the plots. Cutworms and armyworms were abundant throughout this experiment and a general application of poisoned bait was made November 20. On November 21 and 29 about 25 pounds per acre of 5 percent DDT dust was applied to the plants with a rotary hand duster as a further measure of control of cutworms and armyworms. Because of a moderate infestation of wireworms, about 40 pounds per acre of 5 percent chlordane dust was applied between the rows and cultivated into the soil on December 5. These general insecticide applications were necessary to insure a stand of plants. Aphid counts were made at intervals following each aphicide treatment, and a pre-treatment count was made one day before the third treatment was applied. One mature leaf from each of 25 plants taken at random within each plot made up a plot sample. In order to determine the effect of the aphicides upon cutworms, a count of plants damaged by cutworms was made on January 5. Harvest records were obtained from a random sample of 10 heads of cabbage cut from each plot 28 days after the last aphicide treatment. Each cabbage was scored for aphid abundance and extent of worm damage.

DISCUSSION OF RESULTS.—*Aphids:* A general infestation of winged aphids migrated into the plot at about the time the plants were thinned to a stand. Aphid collections were made at the beginning of the experiment and again toward the end of the test. These aphids were identified as the turnip aphid, *Rhopalosiphum pseudobrassicae* (Davis). The infestation in the untreated check increased steadily until a few days following the last insecticide treatment. Table 1 contains data showing this increase in aphid population. The infestation reached its peak at about the time of the third insecticide treatment. Parasitic fungi and lady beetles became well established by this time and were later responsible for some reduction in the aphid population.

All insecticide treatments were significantly better than the unsprayed check on every date aphid counts were made, with the exception of treatment number 1 which was no better

TABLE 1.—Control of the Turnip Aphid, *Rhopalosiphum pseudobrassicae* (Davis), on Chinese Cabbage, Data Showing Aphid Population at Intervals Following Each Insecticide Application.*

Treatment	Number of Days After 1st (Dec. 9) Treatment			Number of Days After 2nd (Dec. 16) Treatment			1 Day Before 3rd Treatment	Number of Days After 3rd (Dec. 30) Treatment	
	1	3	6	1	3	6	(Precount)	1	3
1. 5 percent DDT (oil base)	362	368	804	**	**	**	3,320	1,628	1,515
2. 25 percent DDT emulsion	394	556	858	423	410	760	983	469	620
3. Benzene hexachloride 6 percent gamma isomer (wettable)	161	55	126	20	115	157	83	0	4
4. Benzene hexachloride 1.5 percent gamma isomer (dust)	38	6	3	0	2	1	18	0	9
5. Benzene hexachloride 25 percent gamma isomer (wettable)	68	26	87	5	50	31	4	0	0
6. 50 percent Hexaethyl tetraphosphate	351	413	691	476	962	1,299	1,468	939	965
7. 15 percent Parathion (wettable)	21	2	19	0	0	5	8	0	1
8. 1 percent Parathion (dust)	23	1	10	0	0	0	2	1	4
9. 40 percent Nicotine sulphate	194	290	544	225	785	825	730	85	143
10. 80 percent Nicotine alkaloid (oil base)	226	327	511	430	546	1,122	1,775	638	989
11. Pyrethrins (0.4 percent); Rotenone (2.5 percent)	662	586	650	527	564	754	729	282	462
12. Check, no treatment	953	1,011	1,645	2,132	2,491	2,673	3,880	4,390	3,975
Least significant difference (19:1)	261	283	360	182	322	325	585	548	313

* The number of aphids shown in this table is the total number of aphids per 125 mature leaves.
A 25 leaf sample from each replication was taken at random and the totals for the five applications are recorded.
** DDT emulsion was placed on this plot treatment by mistake, and no records were taken.

than the check one day before the third insecticide treatment was applied. All formulations of parathion and benzene hexachloride gave extremely low aphid counts with almost complete eradication of aphids in the parathion dust and spray plots and the benzene hexachloride (low gamma isomer) dust and benzene hexachloride (high gamma isomer) spray. It is evident from Table 1 that lower dosage rates would be necessary to bring out the difference in effectiveness of benzene hexachloride and parathion. In the case of the 2 counts made 6 days following the first and second aphicide applications and the precount made 13 days following the second treatment, parathion and benzene hexachloride were outstandingly superior to all other materials. It will be noted in Table 1, that following the first treatment of insecticides, both DDT and nicotine applied in an oil base at about 1½ to 2 gallons per acre of diluted spray gave control equal to that obtained with a power sprayer using a water base and applied at about 150 gallons per acre of the diluted spray, despite the fact that less killing agent per acre was applied in the oil based sprays. In subsequent applications the water based sprays gave better control than did the concentrated oil based insecticides. This difference in control probably was due to the inability to secure adequate coverage with the oil-insecticide applicator after the plants became large. Further studies are underway in an effort to develop a more effective spray applicator for concentrated solutions.

Table 2 contains data on aphid abundance at harvest time. These records were obtained 28 days after the last insecticide application was made. A sample of 10 cabbages was collected from each plot and each cabbage was scored as shown below the table. The total score for the 10 heads of cabbage is recorded. Benzene hexachloride and parathion were far superior to any other material used and the differences were highly significant. Nicotine sulphate spray was lower in aphid abundance than were any of the treatments except the parathion and benzene hexachloride. The pyrethrum-rotenone spray was inferior to the nicotine sulphate, parathion and benzene hexachloride treatments, but was definitely superior to the nicotine alkaloid-oil, hexaethyl tetraphosphate, DDT emulsion and DDT-oil treatments. The DDT emulsion and hexaethyl tetraphosphate were superior to the untreated check, but did not approach commercial control. Nicotine alkaloid-oil and the DDT oil treatments were no better than the untreated check.

Table 2.—Chinese Cabbage Harvest Record Showing Effect of Insecticides on Aphid Abundance and Amount of Worm Damage.*

Treatment	Amount Aphid Infestation						Amount Worm Damage					
	Block					Total Score	Block					Total Score
	A	B	C	D	E		A	B	C	D	E	
1. DDT— 5 percent in oil (2 treatments) DDT—25 percent emulsion (1 treatment)	6	14	16	15	19	70	0	0	0	0	1	1
2. DDT—25 percent emulsion	12	6	9	15	11	53	1	0	0	0	0	1
3. Benzene hexachloride (wettable) 6 percent gamma isomer	0	1	0	1	1	3	1	1	0	1	2	5
4. Benzene hexachloride (dust) 1.5 percent gamma isomer	0	0	1	0	0	1	1	0	1	1	2	5
5. Benzene hexachloride (wettable) 25 percent gamma isomer	0	0	0	0	2	2	4	1	0	1	2	8
6. Hexaethyl tetraphosphate—50 percent	6	4	19	7	12	48	10	12	15	9	10	56
7. Parathion—15 percent wettable	0	0	0	0	1	1	0	0	1	1	0	2
8. Parathion—1 percent dust	2	0	1	0	0	3	0	0	0	1	1	2
9. Nicotine sulphate—40 percent nicotine	3	2	3	2	3	13	6	5	10	6	5	32
10. Nicotine alkaloid—80 percent nicotine	12	11	13	11	15	62	2	9	11	8	9	39
11. Pyrethrins (0.4 percent) Rotenone (2.5 percent)	1	6	8	7	3	25	11	4	12	8	4	39
12. Check, untreated	9	12	22	4	18	65	11	10	8	12	11	52
Least significant difference (19:1)						7						12

* A scoring system was used as follows: 0—none 1—slight 2—moderate 3—severe

Ten heads of cabbage per plot were taken for the above scoring.
Worms responsible for damage included cutworms, fall armyworms, cabbage looper.
Three insecticide applications were made as follows: 1st—49 days before harvest 2nd—42 days before harvest 3rd—28 days before harvest

Cutworms: In spite of one application of poisoned bait and 2 dust applications of 5 percent DDT and one of 5 percent chlordane, a considerable number of cutworms remained in the plots beneath the large cabbage plants. Since these insecticide treatments for armyworms and cutworms were general over the entire experiment, an evaluation of the comparative effectiveness of the aphicides against cutworms was possible. On January 5, counts of plants damaged by cutworms were made. Parathion, DDT and benzene hexachloride gave lower counts of damaged plants than the other treatments or the check. The remaining treatments were ineffective against cutworms, with no decrease in damaged plants. Table 2 contains harvest data showing the effect of the insecticide treatments upon the amount of damage caused by cutworms (mostly the black cutworm *Agrotis ypsilon* (Rott.), the fall armyworm, and the cabbage looper. No attempt was made to determine the effect of the treatments on individual species and the data therefore are indicative only of a general larvacide effect on Chinese cabbage in the presence of the above insects. All treatments except hexaethyl tetraphosphate were superior to the check. The DDT, benzene hexachloride and parathion treatments gave good control and were outstandingly better than the remaining treatments and the check. There was no difference between the results obtained with nicotine sulphate, nicotine alkaloid and pyrethrum-rotenone, but these treatments were all superior to hexaethyl tetraphosphate.

SUMMARY.—An experiment on Chinese cabbage designed primarily for the control of aphids and conducted on organic soil at Belle Glade, Florida, during the winter, 1947-48, is reported. The species of aphid encountered was *Rhopalosiphum pseudobrassicae* (Davis). Cutworms, armyworms, and cabbage loopers also were present in the plots and the effectiveness of the treatment against these insects is reported.

The 12 treatments were replicated 5 times in randomized blocks and included several of the new insecticides in addition to standard aphicides. Two materials were used in oil bases and applied at low dosage rates with a special oil applicator under development at the Everglades Experiment Station. Data obtained from periodical aphid counts and harvest records are included in the tables.

Parathion dust and spray and benezene hexachloride dust and spray were found to be outstanding aphicides and gave ex-

cellent control. Harvest records showed nicotine sulphate and pyrethrum-rotenone spray to be fairly effective, but none of the other treatments gave satisfactory control. DDT, parathion and benzene hexachloride treatments gave excellent control of the worms. All other treatments except hexaethyl tetraphosphate gave a reduction in worm damage, but none of these treatments gave satisfactory commercial control.

The treatments in this experiment did not appear to impart any taste to the cabbage, and no injury was noted except that very slight injury occurred on a few plants where benzene hexachloride dust was applied.

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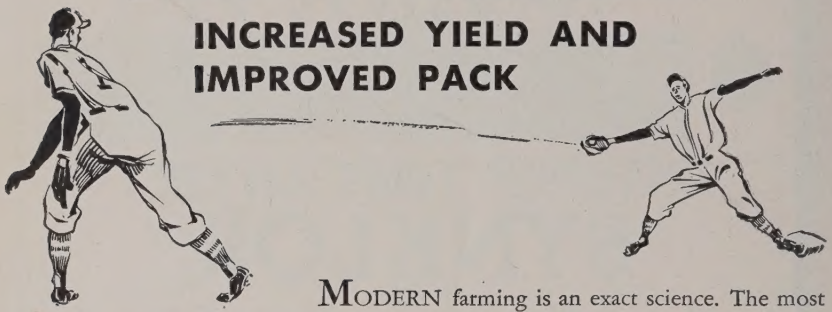

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